

## Nuclear Science Division Newsletter

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**April, 2011**

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### **GRETINA completion and the first engineering run**

On March 22nd 2011, the Department of Energy approved the start of operations for GRETINA (Critical Decision 4, CD-4). The project has been completed on time, on budget, and exceeded many of the key performance parameters. GRETINA started sixteen years ago with the first meeting to discuss the concept and physics opportunities of a tracking array. The Mission Need was approved (CD-0) nine years ago. GRETINA now enters the operations phase with scheduled engineering runs taking place in April, May, and July in Cave 4C of the 88-Inch Cyclotron. It will then be moved and coupled with the BGS for a series of commissioning runs from September to December 2011. Then it will move to the NSCL at MSU to begin physics campaigns at the national laboratories, as agreed upon at the 2007 Richmond meeting.

The first engineering run was carried out successfully April 5-6. The main goals were to test, debug, and optimize GRETINA under high gamma-ray multiplicity conditions. Of particular importance was to learn how the trigger system handles such events, how stable the systems are as a function of rate, and how the signal decomposition and tracking perform under such “battle” conditions. The reaction used was  $^{122}\text{Sn}(^{40}\text{Ar}, 4n)^{158}\text{Er}$  with a 170 MeV Ar beam from the 88-Inch cyclotron. We completed all planned tests and collected about 1 Tbyte of data. Results from an on-line analysis are shown in the figure. Members of the Users Community representing ANL, FSU, ORNL, Richmond and Rochester participated of this run.

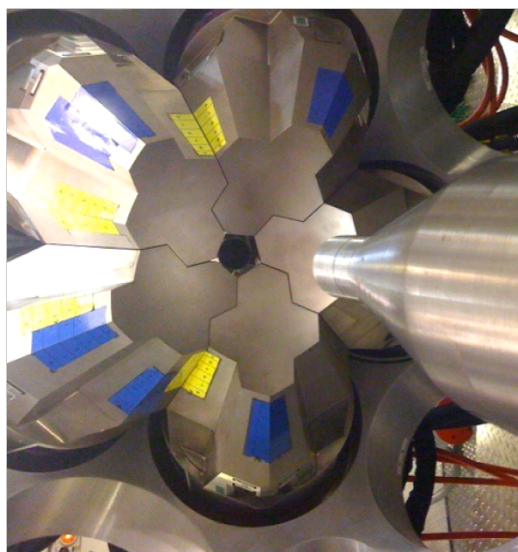
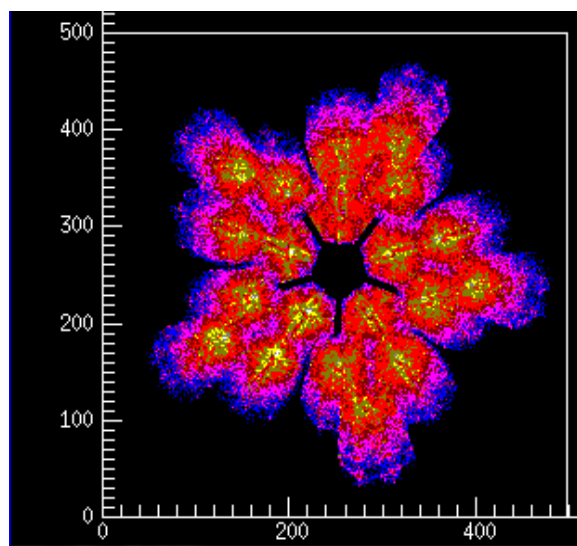
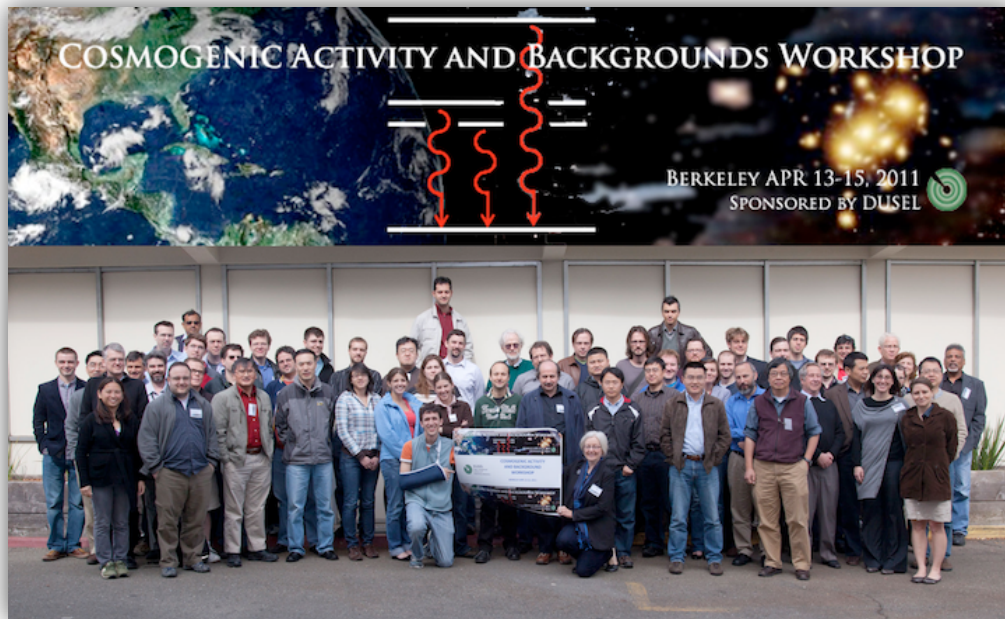


Figure 1. Left panel shows the interaction points determined from the on-line signal decomposition algorithm. Right panel show the actual detector modules.

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### Cosmogenic Activity and Background Workshop

Some 60+ physicists from 25+ U.S. and foreign institutions gathered in the Building 50 auditorium on April 13-15, for three days of discussion on cosmogenic backgrounds to underground experiments, particularly for neutrinoless double beta decay and dark matter searches. In these experiments, radiation induced by cosmic-ray muons is a major concern. Neutrons produced by cosmic-ray muons interacting outside the detector area can travel un-detected and activate detector material, producing a prompt and/or delayed signal in the detector. The cosmogenic activity workshop surveyed our understanding of this area, including the cosmic-ray muon flux, neutron production in muon interactions, neutron activation in different materials and detector design techniques to minimize the effects of these neutrons. Simulation studies played a prominent role, and it appears that current simulations are good to the 30-50% level. Experimenters from many different collaborations presented their experience, and discussed future needs and plans for better simulations and techniques for minimizing the effects of cosmic-rays on backgrounds. This is an important subject because the alternative to minimization is to build a deeper hole – a costly enterprise. The workshop was capped by a Chinese banquet at a local restaurant – a good time was had by all.



The cosmogenic background workshop participants taking a brief photo break.

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### NSD Staffers shower talks on April Meeting of the American Physical Society

The LBNL Nuclear Science Division had a major presence at the 2011 American Physical Society “April” meeting which was held from April 30<sup>th</sup> to May 3, 2011, at the Anaheim convention center. The theme of the meeting, “Celebrating 100 years of Sub-atomic physics,” reflected the major themes of the meeting: Nuclear, Particle and Astro-physics.



One highlight for the NSD was when postdoctoral researcher Huichao Song receives the APS DNP dissertation award in nuclear physics "for pioneering developments in the theory of relativistic viscous hydrodynamics, in particular for the implementation of stable numerical simulations that have been used to quantify the low value of the shear viscosity coefficient observed in ultrarelativistic heavy ion collisions at RHIC, with important implications for the near-perfect fluidity of the quark-gluon plasma." Dr. Song received her PhD from Ohio State University.

Other NSD invited speakers include Brian Fujikawa on “Measurements of Reactor Neutrinos at Long Baselines: KamLAND and Beyond,” Jackie Gates on “Discovery of new superheavy element isotopes,” Volker Koch on “Correlations and the Dynamics of Heavy Ion Collisions,” and Andre Walker-Loud, on “Meson-Meson

Interactions from Lattice QCD.”

Other NSD talks include Ke Han on “CUORE status and recent crystal validation runs” and Thomas O’Donnell on “A three-flavor oscillation analysis of a new KamLAND data set.